

### REMARKS

The Applicants have carefully considered this application in connection with the Examiner's Action mailed January 3, 2003 and respectfully request reconsideration of this application in view of the following remarks. No claims are presently be amended and Claims 1, 4-12 and 15-24 are currently pending in the application.

#### **I. Rejection of Claims 1, 4-12, 15- 24 under 35 U.S.C. §103**

The Examiner has maintained the rejection of Claims 1, 5-6, 8-12, 16-17 and 19-24 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,591,671 to Kim *et al.* ("Kim") in view of U.S. Patent No. 5,714,418 to Bai *et al.* ("Bai") and U.S. Patent No. 5,591,671 to McTeer ("McTeer"). The Examiner further rejected Claims 4 and 15 under 35 U.S.C. §103(a) as being unpatentable over Kim in view of Bai, McTeer and further in view of the Applicant's admitted prior art. The Examiner also rejected Claims 7 and 18 under 35 U.S.C. §103(a) as being unpatentable over Kim in view of Bai, McTeer and further in view U.S. Patent No. 5,970,374 to Teo ("Teo").

The Applicants continue to maintain that the claimed invention is not obvious in view of the foregoing combined references, and that various combinations of these reference fail to establish a *prima facie* case of obviousness of Claims 1, 5-6, 8-12, 16-17 and 19-24 .

As pointed out in the previous response mailed on April 7, 2003, the combination of Kim, in view of Bai and McTeer, for instance, fails to teach or suggest all of the elements of the invention recited in independent Claim1. McTeer, for example, does not teach or suggest subjecting the contact plug to a temperature sufficient to anneal the barrier layer, as recited in Claim 1 and other independent Claims 12 and 24.

In the response to this argument, the Examiner indicated that the Applicants are relying on an optional embodiment (Column 17, Lines 40-45) that wasn't cited in the prior office action. The Applicants respectfully disagree. The Examiner cited FIGURE 6 and Column 19, Lines 12-33 of McTeer for the proposition of subjecting the contact plug to a temperature sufficient to anneal the barrier layer. As clearly pointed out in the previous response, McTeer's opening is filled with copper 3, annealed and caused to reflow, as described in FIGURE 1 (Column 19, Lines 22-24). McTeer himself refers back to FIGURE 1 as to how the contact structure of FIGURE 6 is formed. Therefore, this is not an optional embodiment, as suggested by the Examiner. Rather, this is what McTeer teaches.

As pointed out to Examiner Chaudhuri in a telephone interview on August 8, 2003, McTeer's FIGURE 1 and its associated text (Column 19, Lines 22-24), teach a copper layer 3 hot deposited over the entire surface of the substrate 1 and barrier layer 2 (Column 17, Lines 22-58). McTeer then anneals the copper layer 3 and then causes the copper to reflow at a temperature of greater than about 500°C (Column 17, Lines 50-58). Only later is a contact level dual damascene structure formed by planarization (FIGURE 4; Column 18, Lines 35-58). As such, there is no teaching or suggestion by McTeer of subjecting the contact plug to a temperature sufficient to anneal the barrier layer.

In the Examiner's Action mailed June 11, 2003, it was suggested that the Applicants have erroneously argued that McTeer failed teach or suggest subjecting the contact plug to a temperature sufficient to anneal the barrier layer subsequent to removing a substantial portion of the contact metal and barrier layer to form the contact plug. To further clarify this argument, as explained during the above-mentioned telephone interview, Claim 1 and other independent claims define a contact plug. That is, Claim 1 recites removing a substantial portion of said contact metal and said

barrier layer from said semiconductor substrate to form a contact plug. Subjecting the contact plug to a temperature sufficient to anneal the barrier layer therefore entails that the contact plug has already been formed before annealing. The Applicants can find no teaching or suggestion by McTeer of subjecting the contact plug to a temperature sufficient to anneal the barrier layer. Therefore the Applicants request that the Examiner either remove the McTeer reference or point out where McTeer specifically teaches or suggests planarization to form a contact plug, depicted in FIGURE 6, and then subjecting the contact plug to a temperature sufficient to anneal the barrier layer, as asserted by the Examiner.

Therefore, as previously argued, the combination of Kim in view of Bai and McTeer fails to teach or suggest teach or suggest all of the elements of the invention recited in independent Claim 1.

In summary, the combined teachings of Kim in view of Bai and Lee do not teach or suggest all elements of the present invention and are not properly combinable. This combination of references, therefore fail to establish a *prima facie* case of obviousness with respect to independent Claim 1, as well as independent Claims 12 and 24, which contain analogous elements as Claim 1, or their respective dependent claims, under 35 U.S.C. §103(a). The Applicants therefore respectfully request the Examiner withdraw the rejection and allow Claims 1, 4-12, and 15-24.

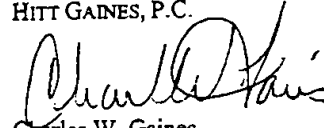
**III. Conclusion**

In view of the foregoing remarks, the Applicants now see all of the Claims currently pending in this application to be in condition for allowance and therefore earnestly solicit a Notice of Allowance for Claims 1, 4-12 and 15-24.

The Applicants request the Examiner to telephone the undersigned attorney of record at (972) 480-8800 if such would further or expedite the prosecution of the present application.

Respectfully submitted,

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